

WELCOME TO DOE'S *RCRA ORIENTATION FOR FACILITY MANAGERS* COURSEWARE

Background This module comprises one component of courseware materials that were developed by DOE's Office of Environmental Policy and Assistance, RCRA/CERCLA Division, EH-413, in response to a request from the Deputy Assistant Secretary for Nuclear and Facility Safety (EH-3). The original course was titled *RCRA Orientation for Nuclear and Facility Safety* and was presented on March 5, 1997, at Germantown, MD. Presentation materials were derived from the more formal three-day course titled DOE's *RCRA Orientation Workshop*, which was developed by EH-413 under a joint funding venture that included the Savannah River Site and the Albuquerque Operations Office.

Courseware Content Although derived from the three-day workshop, DOE's *RCRA Orientation for Nuclear and Facility Safety* (now titled *RCRA Orientation for Facility Managers*) was expanded by developing two new modules to meet the needs of Nuclear Safety Managers. One of the new modules (*Corrective Action*) compares and contrasts RCRA closure and corrective action with CERCLA remedial action by using Oak Ridge Reservation as an example of a radioactively contaminated site closed under RCRA, but undergoing remediation under CERCLA. The other module (*Emerging Issues*) offered a snapshot of the emerging regulations that were expected to impact the Department most dramatically. The remaining courseware modules include:

- Introduction to RCRA and Liability Overview,
- Overview of Solid Waste Determination,
- Overview of Hazardous Waste Determination, and
- Permitting.

PDF "Handout" files only, which contain the aforementioned modules, are designed to serve as stand-alone resources and are equipped with: (1) A list of module contents, (2) Module-specific enabling objectives; (3) Self-assessment questions and answers; (4) A module-specific regulatory citation/key word index; and (5) A module-specific cross-link table that identifies hypertext links to additional Internet resources for hazardous waste-related information.

Using the Courseware Materials Within the PDF Handout modules, users are encouraged to examine the module's Regulatory-Statutory Citation/Key Word Index to identify the availability and location of topics of interest. In contrast, users can simply "dig-in" and sequentially examine the courseware's content. For less extensive reviews or to download additional course presentation materials as needed, users can return to the [RCRA Orientation for Facility Managers Home Page](#) to access electronic files containing the remaining PDF Handout and/or Vugraph files.

To assist users in accessing additional Internet resources, where possible, module-specific hypertext links have been inserted into select points within each of the six PDF Handout courseware modules. Hypertext links appear in both the slide and notes portions as either *blue italicized text* (the first time a link to a particular resource is offered in a given module) or *green italicized text* (each subsequent link to that same resource) and have been assigned to terms and phases for which additional Internet resources such as other EH-413 guidance documents, other Internet Websites, etc. are available. Upon identifying a highlighted term or phase of interest, users generally can access the additional Internet resources by clicking on the highlighted text, which will then hypertext link to another Internet resource. Additional information for obtaining those resources that are not Internet-accessible as well as the objectives, content and organization, use, list of acronyms, Internet resources, and master index is presented in the [*Front-End Materials section*](#) (first section).

**Feedback
And
Contacts**

If you have difficulty in downloading or reviewing modules comprising DOE's *RCRA Orientation for Facility Managers*, [contact our Webmaster](#) and please [provide us with feedback](#). If you are interested in attending the three-day *RCRA Orientation Workshop*, please contact the [National Environmental Training Office](#). Additional questions concerning this courseware or the information presented therein may be directed to Atam Sikri of my staff by:

- Calling at (202) 586-1879,
- Faxing messages to (202) 586-0955, or
- Communicating electronically, via Internet, to atam.sikri@eh.doe.gov.



Definition of Hazardous Waste -- Module HW

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Additional Resources Cited in this Module (Internet-Accessible Unless Otherwise Noted)

“Hazardous” Terminology; DOE/EH-231-003/0191;
<http://tis-nt.eh.doe.gov/oepa/cercla/hazterms.pdf>

Automated Underground Storage Tank Guidance (Macintosh Version);
<http://tis-nt.eh.doe.gov/oepa/programs/ust.html>

Solid Waste Landfills Under RCRA Subtitle D, DOE/EH-0512; [not available on OEPA Website]

RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version);
<http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html>

OEPA Environmental Law Summary: Resource Conservation and Recovery Act;
http://tis-nt.eh.doe.gov/oepa/law_sum/RCRA.HTM

EPA Mixed Waste Team Home Page;
<http://www.epa.gov/radiation/mixed-waste/index.html#general>

Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf>

Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf>

National Archives and Record Administration “Code of Federal Regulations - Retrieve CFR by citation”; <http://www.access.gpo.gov/nara/cfr/index.html>

Hazardous Waste Generator Requirements, DOE/EH-231-055/1194 (Revised August 1997);
http://tis-nt.eh.doe.gov/oepa/guidance/rcra/gener_rv.pdf

Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings;
DOE/EH-231-008/1291; <http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf>

“Code of Federal Regulations - Retrieve CFR by citation” ;
<http://www.access.gpo.gov/nara/cfr/index.html>

The Mixture Rule Under the Resource Conservation and Recovery Act,
DOE/EH-231-005/0991; <http://tis-nt.eh.doe.gov/oepa/guidance/rcra/mixture.pdf>

The “Derived-from” Rule under the Resource Conservation and Recovery Act,
DOE/EH-231-035/0693;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/derived.pdf>

Mixed Waste Focus Area; <http://wastenot.inel.gov/mwfa/index.html>

LDR Program Overview, DOE/EH-231/005-0293; <http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ldr-over.pdf>

Ignitable, Corrosive, Reactive, and Incompatible Wastes; DOE/EH-231-054/1294;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ignit.pdf>

Questions and Answers on the RCRA Toxicity Characteristic; DOE/EH-231-002/0191
[NOT available on OEPA Website]

“DOE Methods for Evaluating Environmental and Waste Management Samples”;
<http://www.pnl.gov/methods/index.html>

OEPA Environmental Law Summary: Resource Conservation and Recovery Act;
http://tis-nt.eh.doe.gov/oepa/law_sum/RCRA.HTM

Complying with LDRs for Contaminated Soil & Debris, DOE/EH-231-002/0191;
<http://tis-nt.eh.doe.gov/oepa/guidance/cercla/soildbrs.pdf>

Information — Lead and Lead Products Contaminated with Radioactive Material;
dated June 27, 1997; “<http://tis-nt.eh.doe.gov/oepa/guidance/aea/lead.pdf>”

Federal Register Online via GPO Access; http://www.access.gpo.gov/su_docs/aces/aces140.html

DOE Consolidated Comments - 60 FR 43654, "Land Disposal Restrictions--Phase IV: Issues Associated With Clean Water Act Treatment Equivalency, and Treatment Standards for Wood Preserving Wastes and Toxicity Characteristic Metal Wastes";
<http://tis-nt.eh.doe.gov/oepa/comments/rcra/ldr4-cmt.pdf>

Waste Management and the Land Disposal Restriction Storage Prohibition; DOE/EH-231-011/0592;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/storage.pdf>

DOE Environmental Guidance - Toxic Substances Control Act;
<http://tis-nt.eh.doe.gov/oepa/guidance/tsca.htm>

Used Oil Final Rule and Correction Notices Issued; Environmental Guidance Regulatory Bulletin dated October 31, 1993 [NOT available on the OEPA Website]

Treatability Study Sample Exemption—Update; EH-413-071/0197;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/treat-ib.pdf>

Hazardous Debris Case-By-Case Capacity Variance; Environmental Guidance Regulatory Bulletin dated July 15, 1992; <http://tis-nt.eh.doe.gov/oepa/guidance/rcra/debris.pdf>

Requirements for the Recycling of Hazardous Waste; DOE/EH-231-001/0990;
<http://tis-nt.eh.doe.gov/oepa/guidance/rcra/recycle.pdf>

Special Requirements Applicable to Hazardous Waste Automated Guidance
(Windows Version); <http://tis-nt.eh.doe.gov/oepa/programs/special.html>

Universal Waste Rule: Final Rule Issued; Environmental Guidance Regulatory Bulletin dated August 14, 1995 [NOT available on the OEPA Website]

DOE Consolidated Comments - Resource Conservation and Recovery Act; “Hazardous Waste Management System: Identification and Listing of Hazardous Waste: Hazardous Waste Identification Rule (HWIR)”; <http://tis-nt.eh.doe.gov/oepa/comments/rcra/hwir-com.pdf>

DOE Consolidated Comments - Resource Conservation and Recovery Act; “Consolidated Departmental Response to Proposed Hazardous Waste Identification Rule for Contaminated Media (HWIR-Media)”; <http://tis-nt.eh.doe.gov/oepa/comments/rcra/hwir2.PDF>

Definition of Hazardous Waste



The paramount objective is to understand the entry point into RCRA Subtitle C jurisdiction. Waste identification and listing specifications are complex. At a minimum, you should be able to do the following by the completion of this module:

1. Define hazardous materials, hazardous waste, hazardous constituents, and hazardous substances. (p. HW-2)
2. Follow the process required to determine if wastes are hazardous. (pp. HW-4, 5)
3. List the listed hazardous waste codes. (pp. HW-7-11)
4. Define the 10% rule for solvents. (p. HW-7)
5. Define the most general version of the mixture rule and recognize that it has several specific exemptions. (pp. HW-12 and HW-34)
6. Define the derived-from rule and its exemptions. (pp. HW-13 and HW-35)
7. Define the contained-in principle. (p. HW-14)
8. List the characteristics of hazardous waste. (pp. HW-15-21)
9. Recognize the RCRA definitions for each characteristic. (pp. HW-16-21)
10. Distinguish between “D,” “F,” “K,” “P,” and “U” waste codes. (p. HW-6)
11. Explain the significance of LDR relative to waste determinations (pp. HW-23-27)
12. Recognize exclusions from the hazardous waste definition. (pp. HW-29-33)
13. List several types of recyclable materials. (p. HW-36)
14. Recognize the criteria for defining a container as “empty.” (pp. HW-38, 39)
15. Define “delisting.” (p. HW-40)

Hazardous?

- **Hazardous Material**
 - Regulated by DOT
 - Regulated by OSHA
- **Hazardous Constituents**
 - Listed in Appendix VIII 40 CFR 261
 - Not hazardous wastes but may be basis for listing a waste as hazardous
- **Hazardous Waste**
- **Hazardous Substance**

Before discussing specific elements of the definition of hazardous waste, it is important to start from a common understanding of definitions.

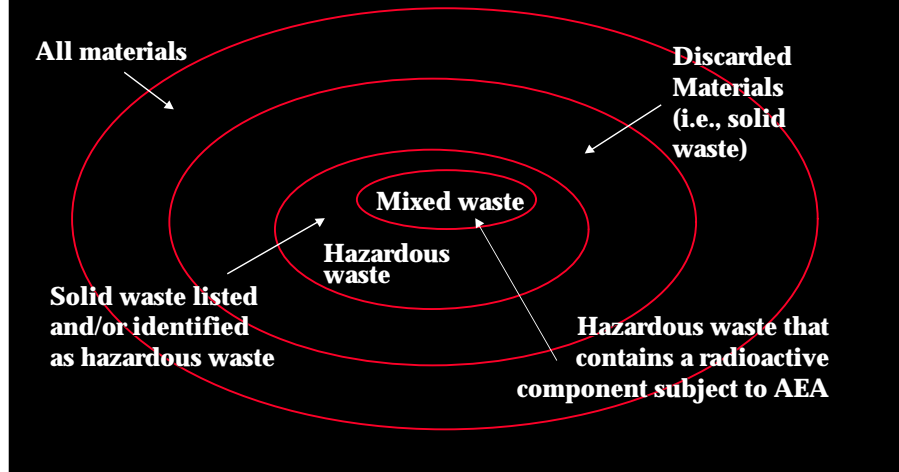
Hazardous materials, which can include both materials and wastes, are regulated by Department of Transportation regulations. These materials also include products in use that are regulated by the Occupational Safety and Health Administration standards for storage, handling, and personnel exposure.

Hazardous constituents are those chemical constituents that EPA considers in determining whether specific wastes should be regulated as hazardous wastes. The list appears in 40 CFR 261, Appendix VIII. Waste streams containing these constituents are not regulated as hazardous merely because the constituents are present. The waste stream must first be listed as hazardous, or be hazardous by characteristic. The presence of the hazardous constituents, however, would be the basis for promulgating a rule to list the waste stream as hazardous. So, all hazardous wastes contain hazardous constituents, but not all hazardous constituents are hazardous wastes.

Hazardous wastes are those solid wastes that meet criteria defined in 40 CFR Part 261 Subparts C and D.

Hazardous substances are substances listed in 40 CFR 302 for which facilities are responsible for release reporting and response.

Let' Pick Up Where We Left Off. The Definition of Hazardous Waste Begins With The Solid Waste Definition



Evaluating discarded materials to determine their hazard is a step-by-step process. Each question answered about the material leads to another set of questions until the material and RCRA's jurisdiction over it have been determined.

RCRA does not regulate all materials. It addresses a variety of materials, however, under specific circumstances.

Under *Subtitle I*, for example, RCRA regulates any material (product or waste) that (1) is a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or a petroleum product, (2) is managed in an UST, and (3) is not regulated as a hazardous waste.

Under *Subtitle D*, RCRA regulates discarded materials that meet the definition of *solid waste* but do not qualify as hazardous waste.

Under *Subtitle C*, RCRA regulates discarded materials that both meet the definition of solid waste and are identified and/or listed as hazardous waste in 40 CFR Part 261, Subpart C and/or D. Therefore, RCRA-regulated materials are a subset of all materials managed at a facility. The larger subset is solid waste. Hazardous waste is a subset of solid waste. Moreover, *mixed waste* is a subset of hazardous waste.

Overview of the Definition of Hazardous Waste

- Is the waste excluded?
- Is the waste listed?
 - Is it a mixture of solid waste and listed hazardous waste?
 - Is it derived from the treatment, storage, or disposal of a listed hazardous waste?
 - Does it contain a listed hazardous waste?
- Is the waste a characteristic hazard?

A **solid waste** becomes a hazardous waste:

- when it meets a listing description
- when the waste exhibits a hazardous waste characteristic
- for a mixture, when a hazardous waste is mixed with a solid waste
- for a “derived-from” waste, when it is generated as a result of treatment, storage, or disposal

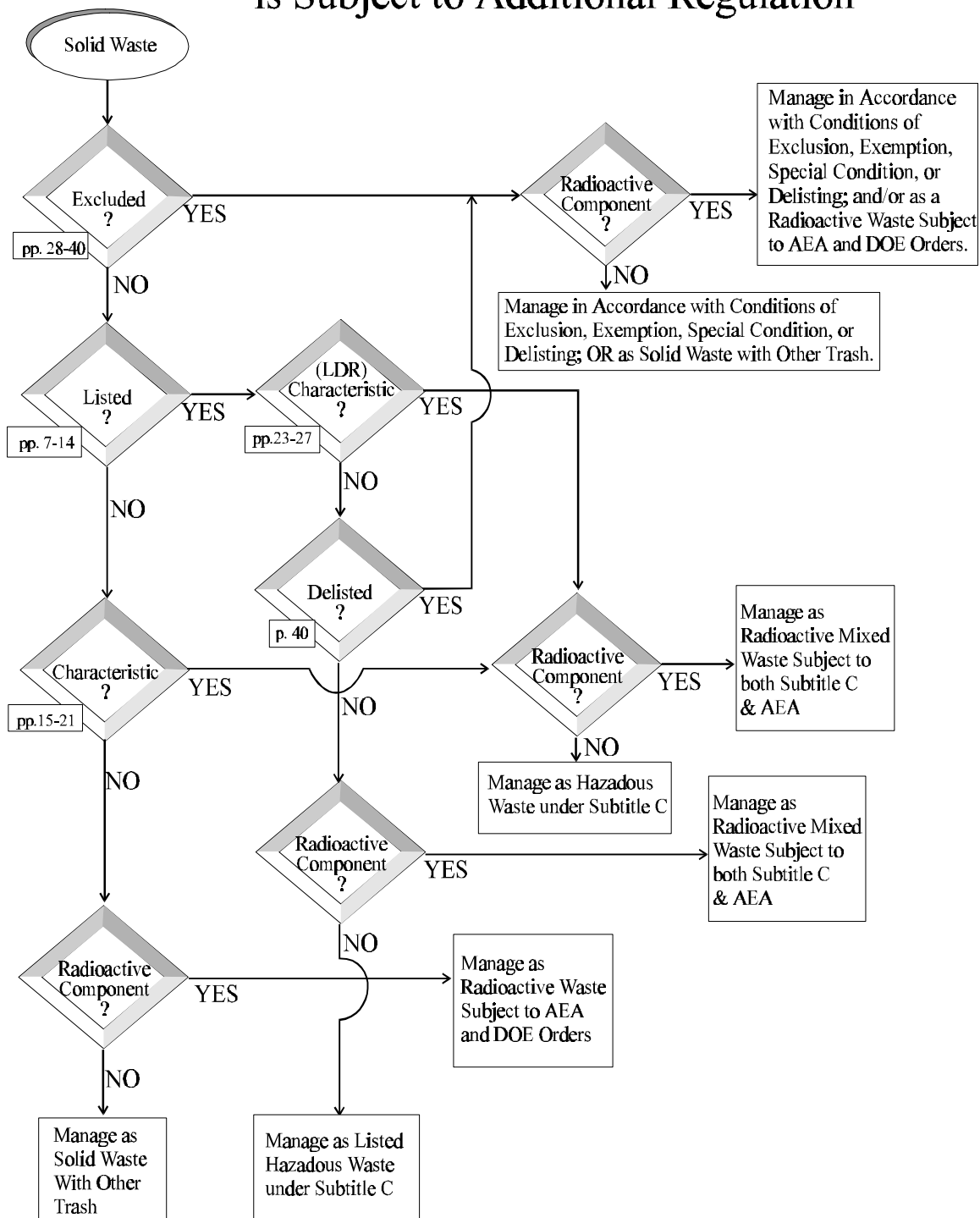
A hazardous waste ceases to be a hazardous waste:

- for a listed waste, when **delisted** under 40 CFR 260.22
- for a characteristic waste, when it no longer exhibits any hazardous characteristic

Under **40 CFR 262.11**, **generators** of solid wastes must evaluate their wastes at the initial point of generation to determine whether the wastes are hazardous. EPA has established a hierarchy for performing this determination. Generators should first determine if the waste is excluded from regulation. If the waste is not **excluded**, although it seems to contradict the regulations because of the structure (i.e., Subpart C precedes Subpart D in the regulations), the generator should evaluate the listings to determine whether the **waste meets a listing** prescribed in Subpart D. Finally, if the waste does not meet a listing, the generator must determine whether the **waste exhibits a characteristic** found in Subpart C.

Figure 1 on the next page outlines the decisional framework to be followed when performing a generator determination. Although determining whether the waste is excluded is the first decision diamond, we will hold off on addressing this question until we have a foundational understanding of the individual hazardous waste listings and characteristics.

Figure 1. Steps to Determine if Solid Waste is Subject to Additional Regulation



Examining the Second and Third Questions -- Listings and Identification

Subpart D - Lists of Hazardous Wastes

- **Wastes from non-specific sources**
- **Wastes from specific sources**
- **Discarded commercial chemical products**

Subpart C - Characteristics of Hazardous Wastes

- **Ignitability**
- **Corrosivity**
- **Reactivity**
- **Toxicity**

Subpart D of 40 CFR Part 261 contains the prescribed listings (F-, K-, P-, and U-lists) of hazardous waste. *Subpart C (of 40 CFR Part 261)* contains criteria for identifying characteristically hazardous wastes (D001-D043).

As previously mentioned (and as illustrated by Figure 1 on the preceding page), EPA has established a hierarchy for performing the hazardous waste determination. We will address the question of whether a waste is excluded, exempted, or subject to special conditions later in this module. The second decision diamond (i.e., step) entails determining whether the waste meets a listing found in Subpart D.

It is important to note that although EPA designates characteristically hazardous waste using “D” waste codes, characteristic wastes do not qualify as “listed” hazardous waste. This distinction is very important when dealing with the “*mixture*” and “*derived from*” rules, as well as the “*contained in*” policy, all of which will be addressed during the listed waste discussion.

Listed Hazardous Wastes

- **Subpart D - Lists of Hazardous Wastes**
 - **Wastes From Non-specific Sources**
 - **Wastes From Specific Sources**
 - **Discarded Commercial Chemicals**

There are four lists of hazardous wastes in Subpart D of 40 CFR Part 261.

F-listed wastes -- Wastes from non-specific sources

- 30 “F” wastes
- Examples: Spent solvents (tetrachloroethylene, trichloroethylene, carbon tetrachloride) from degreasing operations

K-listed wastes -- Wastes from specific industry sources


- 100 “K” wastes
- Examples: “Oven residue from the production of chrome oxide green pigments”
“Distillation bottoms from the production of nitrobenzene by the nitration of benzene”

P-listed wastes -- acute hazardous commercial chemical products, off-specification species, container residues, and spill residues

- 100 “P” wastes
- Examples: Discarded aldicarb (a pesticide), phosgene, carbon disulfide, and methyl isocyanate

U-listed wastes -- Hazardous commercial chemical products, off-specification species, container residues, and spill residues

- 215 “U” wastes
- Examples: Discarded acetone, benzene, creosote, DDT

<p style="text-align: center;">(F-Listed) Waste from Non-specific Sources (40 CFR 261.31)</p>	
EPA Code	Waste
	<p>Spent halogenated solvents from degreasing: tetra- and trichloroethylene, methylene chloride, trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons</p>

The term "non-specific sources" means that the waste can be produced by any industry/activity. If a waste meets the description associated with the specific waste code, it bears that code. The constituent and the generating activity are both important in determining whether a waste qualifies under a specific waste code.

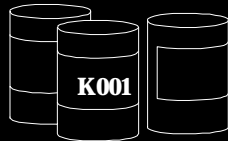
In the example above, the term "*spent*" is important. A material is spent when it has collected sufficient contaminants to prevent its reuse. The specific constituents are also important. If those specific constituents are present, but the material is not spent, the waste would not qualify as F001. If the material is spent, but it does not contain those specific constituents, it would also not qualify under F001.

Common "F" wastes for DOE facilities are spent solvents and spent electroplating wastes.

(K-Listed)
Waste from Specific Sources
(40 CFR 261.32)

EPA Code

Waste



**Bottom sediment sludge
from treatment of
wastewaters from wood
preserving that uses
creosote and/or
pentachlorophenol**

Wastes from specific sources are wastes from industries specified in the waste description. Similar wastes not generated by that industrial activity are not regulated under the "K" code.

(P- and U-listed)
Listed Discarded Commercial Chemicals
(40 CFR 261.33)

- **Off-specification forms of these products**
- **Mixtures of these products and other materials that are applied to the land**
- **Mixtures of oil and these products when used as a fuel**
- **Containers holding these products, unless they are empty**
- **Spill residues of these products**

The important terms to remember associated with discarded chemical products are "unused" and "sole active ingredient." Discarded commercial chemical products are chemicals that appear in 40 CFR 261.33 lists that have not been used and have only one active ingredient. They may include a large fraction of inactive ingredients.

Note also that the listing includes spill residues. If a chemical is spilled, the spill residue becomes discarded and will be hazardous by the waste code of the spilled chemical. If the spill residue involved one of the chemicals, such as acetone, that is listed solely because of a characteristic, the residue would be classified under the appropriate U-waste code, even if the residue were no longer characteristically hazardous.

Types of Discarded Commercial Chemicals:



- **"P" List**

- Acute hazardous waste
- Examples are beryllium, methyl isocyanate, and soluble cyanide salts



- **"U" List**

- Toxic waste
- Examples are benzene, saccharin salts, and trichloroethylene

The list of discarded commercial chemical products is divided into two categories, acute hazardous waste and toxic waste. The acute hazardous waste list, the "P" list [**40 CFR 261.33 (e)**], includes constituents that can cause injury or death with only small exposures.

The list of toxic chemicals, the "U" list [**40 CFR 261.33(f)**], includes chemicals that are teratogenic, carcinogenic, mutagenic, and/or toxic but are not likely to be immediately dangerous to life.

Mixture Rule Wastes **[40 CFR 261.3(a)]**



- **Mixtures of solid wastes with listed wastes**
- **Mixtures of solid wastes with characteristic wastes**

“Mixture” refers to mixtures of solid and hazardous wastes and should not be confused with [mixed waste](#).

When solid wastes are mixed with listed wastes, the resultant mixture is itself that listed waste. A mixture of solid wastes with listed wastes, if listed solely on the basis of a characteristic, it is not hazardous when the resulting mixture no longer exhibits the characteristic. [40 CFR 261.3(a)(iii)] Also, if the listed waste is delisted, and is not a characteristic waste, it is no longer hazardous. When considering treatment options and management strategies, generators must remember that dilution of waste as a means to avoid treatment is prohibited under the [land disposal restrictions \(LDR\)](#).

Mixtures of solid wastes with characteristic wastes are only hazardous if the resulting mixture continues to exhibit a characteristic.

“Derived-From” Wastes **[40 CFR 261.3(c)]**

- **Definition**

Any *solid waste* generated from the treatment, storage, or disposal of a hazardous waste, including any sludge, spill residue, ash, emission control dust, or leachate (but not including precipitation run-off) is a “derived from” waste.

A solid waste derived from the storage, treatment, or disposal of a listed hazardous waste is a hazardous waste.

A solid waste derived from the storage, treatment, or disposal of a characteristic hazardous waste is only a hazardous waste if it exhibits a hazardous characteristic.

“Contained-In” Principle

- **Originally established to address contaminated media (e.g., soil)**
- **Exempts debris that the Regional Administrator, considering the extent of contamination, has determined is no longer contaminated with hazardous waste.**

The **contained-in policy** was originally developed to address mixtures of listed waste and environmental media (e.g., groundwater). Such mixtures are not mixtures of solid waste and listed waste subject to the **mixture rule**. They are environmental media that contain listed waste. If the listed waste can be removed by treatment, all that remains is the soil or groundwater that was contaminated. This soil or groundwater can be returned to the environment. EPA and authorized states continue to determine when groundwater and soil no longer contain hazardous waste on a case-by-case basis under the contained-in policy interpretation.

In the August 18, 1992, *FR* notice (57 *FR* 37264), EPA codifies the contained-in principle. Until promulgation of this final rule, the contained-in principle relied upon EPA-developed interpretive letters and memoranda. Under this rule, provided debris does not exhibit a characteristic of hazardous waste, EPA will determine on a case-by-case basis whether the debris, as generated or following treatment, is contaminated with hazardous waste. Debris that is no longer considered contaminated with hazardous waste is not subject to regulation [**40 CFR 261.3(f)(2)**].

Hazardous Waste Characteristics

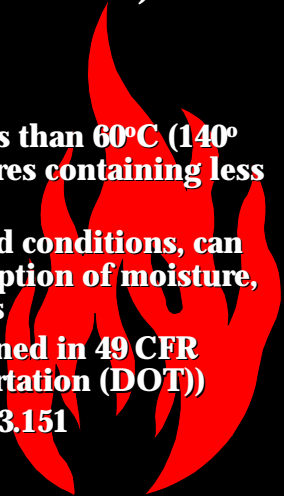
- **Subpart C - Characteristics of Hazardous Waste**
 - Ignitability
 - Corrosivity
 - Reactivity
 - Toxicity

There are currently four characteristics of hazardous waste appearing in **40 CFR 261 Subpart C**:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity

In order for EPA to establish characteristics which render a waste hazardous, the characteristic must meet statutory criteria and either be measurable by available standard methods or be reasonably determinable based on knowledge of the waste.

Ignitable Hazard (40 CFR 261.21)

- ***D001***
 - **A liquid with a flash point of less than 60°C (140° F), except aqueous alcohol mixtures containing less than 24% alcohol.**
 - **A non-liquid that, under standard conditions, can cause fire through friction, absorption of moisture, or spontaneous chemical changes**
 - **Ignitable compressed gas as defined in 49 CFR 173.300 (Department Of Transportation (DOT))**
 - **Oxidizer as defined in 49 CFR 173.151**
- 

Discarded paints and partially full spray cans of various materials are common examples of ignitable wastes. Some discarded solvents (e.g., some fractions of petroleum naphtha) are commonly discarded ignitable wastes. Strong oxidizers, such as potassium permanganate, are also considered ignitable wastes when discarded.

Corrosive Characteristic (40 CFR 261.22)

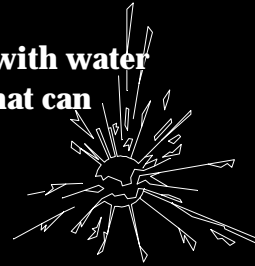


- ***D002***
- **Aqueous solution with a pH less than or equal to 2 or greater than or equal to 12.5**
- **A liquid that corrodes steel at a rate greater than 6.35 mm per year at 55 degrees C (130 degrees F)**

Corrosive hazardous wastes must be liquids and include both highly acidic and highly basic solutions. These wastes include discarded solutions from nuclear fuel reprocessing, metal cleaning and etching, laboratory operations, and photographic processing. The RCRA criteria for corrosivity consider both the pH of the material as well as its overall corrosive behavior.

Reactive Characteristic **(40 CFR 261.23)**

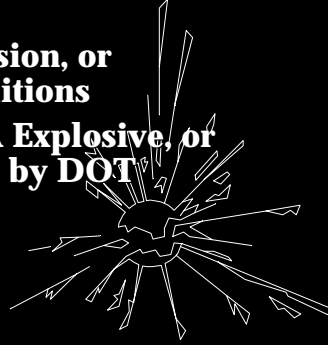
- **D003**
- **Normally unstable and readily undergoes violent change**
- **Reacts violently with water**
- **Forms potentially explosive mixtures with water**
- **Generates toxic gases when mixed with water**
- **Cyanide or sulfide-bearing waste that can produce toxic gases**



DOE's research and production facilities have many examples of reactive wastes. Among these are aged chemicals such as ethers and picric acid. Such aged chemicals can be sufficiently unstable to consider them Forbidden Explosives under Department of Transportation rules. In addition, explosives are occasionally a component of research projects. Water reactives such as solid sodium are also among the reactive wastes generated from DOE activities.

Reactive Characteristic **(Continued)**

- **Capable of detonation if exposed to heat or a strong initiating source**
- **Capable of detonation, explosion, or reaction under standard conditions**
- **Forbidden Explosive, Class A Explosive, or Class B Explosive, as defined by DOT**



Toxicity Characteristic **(40 CFR 261.24)**



- **D004 - D043**
- **Based on a leachability test (TCLP)**
- **Waste is deemed hazardous if it equals or exceeds threshold concentrations for specified constituents**
- **Test method 1311 published in EPA Publication **SW-846**; incorporated by reference [App. II to Part 261]**

The underlying assumption of the toxicity characteristic (TC) is that the most likely disposal scenario for nonhazardous solid waste is a sanitary waste landfill. In such an environment, acidic leachate is generated from rainwater percolating through the decaying organic materials. Such leachate could mobilize toxic constituents from the solid waste.

The Toxicity Characteristic Leaching Procedure (TCLP) attempts to model that scenario by exposing waste samples to acidic extractant. If concentrations of hazardous constituents are found in the extractant and equal or exceed the TC thresholds (listed on the next page), the waste is considered hazardous.

The TC thresholds are based on modeling the dilution/attenuation of the constituent as it migrates from the landfill to a downstream receptor well. Constituent concentrations at the receptor well must fall below the Maximum Contaminant Levels established under the Safe Drinking Water Act.

Toxicity Characteristic (continued)

- **40 constituents identified under toxicity characteristic**
 - **8 metals**
 - **7 pesticides/herbicides**
 - **25 other organic compounds**

Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA Code	Contaminant	Regulatory Level (mg/l)	EPA Code	Contaminant	Regulatory Level (mg/l)
D004	Arsenic	5.0	D031	Heptachlor	0.008
D005	Barium	100.0	D032	Hexachlorobenzene	0.13
D006	Cadmium	1.0	D033	Hexachlorobutadiene	0.5
D007	Chromium	5.0	D034	Hexachloroethane	3.0
D008	Lead	5.0	D035	Methyl ethyl ketone	200.0
D009	Mercury	0.2	D036	Nitrobenzene	2.0
D010	Selenium	1.0	D037	Pentachlorophenol	100.0
D011	Silver	5.0	D038	Pyridine	5.0
D012	Endrin	0.02	D039	Tetrachloroethylene	0.7
D013	Lindane	0.4	D040	Trichloroethylene	0.5
D014	Methoxychlor	10.0	D041	2,4,5-Trichlorophenol	400.0
D015	Toxaphene	0.5	D042	2,4,6-Trichlorophenol	2.0
D016	2,4-D	10.0	D043	Vinyl Chloride	0.2
D017	2,4,5-TP Silvex	1.0			
D018	Benzene	0.5			
D019	Carbon tetrachloride	0.5			
D020	Chlordane	0.03			
D021	Chlorobenzene	100.0			
D022	Chloroform	6.0			
D023	o-Cresol	200.0			
D024	m-Cresol	200.0			
D025	p-Cresol	200.0			
D026	Cresol	200.0			
D027	1,4-Dichlorobenzene	7.5			
D028	1,2-Dichloroethane	0.5			
D029	1,1-Dichloroethylene	0.7			
D030	2,4-Dinitrotoluene	0.13			

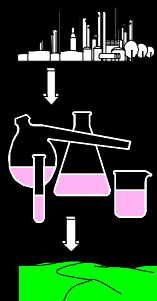


Objective of LDR

HSWA established deadlines for EPA to determine the conditions under which land disposal of hazardous waste is protective of human health and the environment. Without a determination, Congress prohibited land disposal.

In 1984, Congress addressed the inherent uncertainty of land disposal by drafting the *Hazardous and Solid Waste Amendments (HSWA)* to RCRA. HSWA was enacted on November 8, 1984 and prohibits land disposal of hazardous wastes without treatment and, thus, forced development of new technology to ensure that residues requiring land disposal do not contain concentrations of hazardous constituents that could pose a threat to human health and the environment.

LDR Summary



- **Generate LDR waste**
- **Treat waste on-site or ship off-site for treatment to meet the applicable treatment standard**
- **Land dispose the residue**

As previously discussed, each generator is responsible for conducting a hazardous waste determination whenever they generate a solid waste. For the purposes of complying with the land disposal restrictions (LDR), each generator is also responsible for determining, at the initial point of generation, any and all of the listings **AND** characteristics that apply. Thus, waste will carry the waste code(s) for any applicable listing, as well as one or more of the waste codes under 40 CFR 261, subpart C where the waste also exhibits a characteristic. One exception to this provision is recognized and this occurs when the treatment standard for a listed waste specifically addresses the characteristic(s).

Most wastes must be treated to meet numeric standards based on the performance of best demonstrated available technology (BDAT). In some cases, the waste must be treated by a specified treatment technology before land disposal. Compliance with the treatment standards is verified by either: (1) analyzing the treatment residues and comparing the results against the EPA-established concentrations, or (2) reviewing documentation that the specified technology was used.

The ultimate disposition of the treatment residue depends on whether the waste is a listed hazardous waste and/or a characteristic hazardous waste. Residues from the treatment of listed hazardous wastes are also listed hazardous wastes under the derived-from rule in 40 CFR 261.3(c)(2). Such treatment residues must be disposed of in a hazardous waste disposal facility regulated under Subtitle C of RCRA. If characteristic hazardous wastes are treated and the treatment residue is no longer a characteristic hazard, the treatment residue can be disposed of in a solid waste disposal facility regulated under RCRA Subtitle D.

What Standards Must be Met to *Land Dispose*?

- EPA established requirements based on **Best Demonstrated Available Technologies (BDAT)**.
- Standards accommodate treatability groups and appear in **40 CFR 268.40**, table “Treatment Standards for Hazardous Waste.”
- Treatability groups based on waste code (e.g., D009), treatability subcategory (e.g., radioactive lead solids), and form (i.e., wastewater or nonwastewater).

The treatability of waste depends on the constituents in the waste and the waste form. To establish standards under LDR, EPA examined the BDAT for different treatability groups. Treatment standards found in **40 CFR 268.40**, table “Treatment Standards for Hazardous Wastes” are based on the use of BDAT. Hazardous waste generators initiate their LDR characterization efforts by reviewing this table.

When applying BDAT, EPA considers waste codes (the designations in 40 CFR 261 Subparts C and D), treatment subcategories, and waste form (wastewater and nonwastewater). EPA defines a wastewater as a waste form with less than 1% total suspended solids (TSS) and less than 1% by weight total organic carbon (TOC). There are some exceptions to this definition of wastewater. The most important exception is that for spent solvents that are F001 - F005 waste codes, which must contain less than 1% by weight total organic carbon (TOC) or less than 1% of the regulated solvent constituents to be considered wastewaters. (**40 CFR 268.2**)

Special considerations have been made for radioactively contaminated hazardous waste. For example, the waste code D008, lead waste, is further subdivided into treatment subcategories including wastes that exhibit (or are expected to exhibit) the characteristic of toxicity for lead, lead acid batteries, and **radioactive lead solids**. D009, mercury waste, is another example. This waste code has six subcategories including : (1) high mercury-organic, (2) high mercury-inorganic, (3) low mercury, (4) all D009 wastewaters, (5) elemental mercury with radioactive materials, and (6) hydraulic oil contaminated with mercury radioactive materials. Each treatment subcategory and form (wastewater or nonwastewater) can have a different LDR standard that must be met prior to the land disposal of the treatment residue.

Underlying Hazardous Constituents Must Meet UTS

- **40 CFR 268.48** - Universal Treatment Standards (UTS) must be met for the underlying hazardous constituents in the following wastes:
 - Certain ignitable (D001) and corrosive (D002) characteristic hazardous wastes
 - Organic pesticide toxicity characteristic wastes (D012 - D017)
 - New organic toxicity characteristic wastes (D018-D043)

To comply with a September 25, 1992 decision of the U.S. Court of Appeals in *Chemical Waste Management v. EPA*, 976 F.2d 2 (D.C. Cir. 1992), EPA amended the treatment standards under LDR for certain wastes displaying the characteristics of ignitability (EPA Hazard Code D001) and corrosivity (EPA Hazard Code D002). Provided these wastes are not managed in a CWA treatment system, CWA-equivalent system, or Class I injection well regulated under the Safe Drinking Water Act, EPA requires ignitable and corrosive wastes for which the treatment standard is deactivation to also meet treatment standards for underlying hazardous constituents (UHCs) whenever those constituents are reasonably expected to be present at the point of generation in concentrations exceeding their respective UTS levels.

As with the hazardous waste determination, generators may base their determination of “reasonably expected to be present” on their knowledge of the raw materials used, the process, and potential reaction products, or the results of a one-time analysis for the entire list of underlying hazardous constituents. In a [September 19, 1994 \(Phase II\) FR](#) notice, EPA expanded the application of this approach to include wastes that exhibit the characteristic of toxicity for pesticides and/or organics (59 [FR](#) 47980). EPA also has proposed to apply this concept to the TC metal wastes ([60 FR 43654](#)). For these wastes, the UTS apply to the underlying hazardous constituents in the TC waste as well as the individual constituent(s) responsible for the TC designation.

What Does LDR Mean to *Generators*?

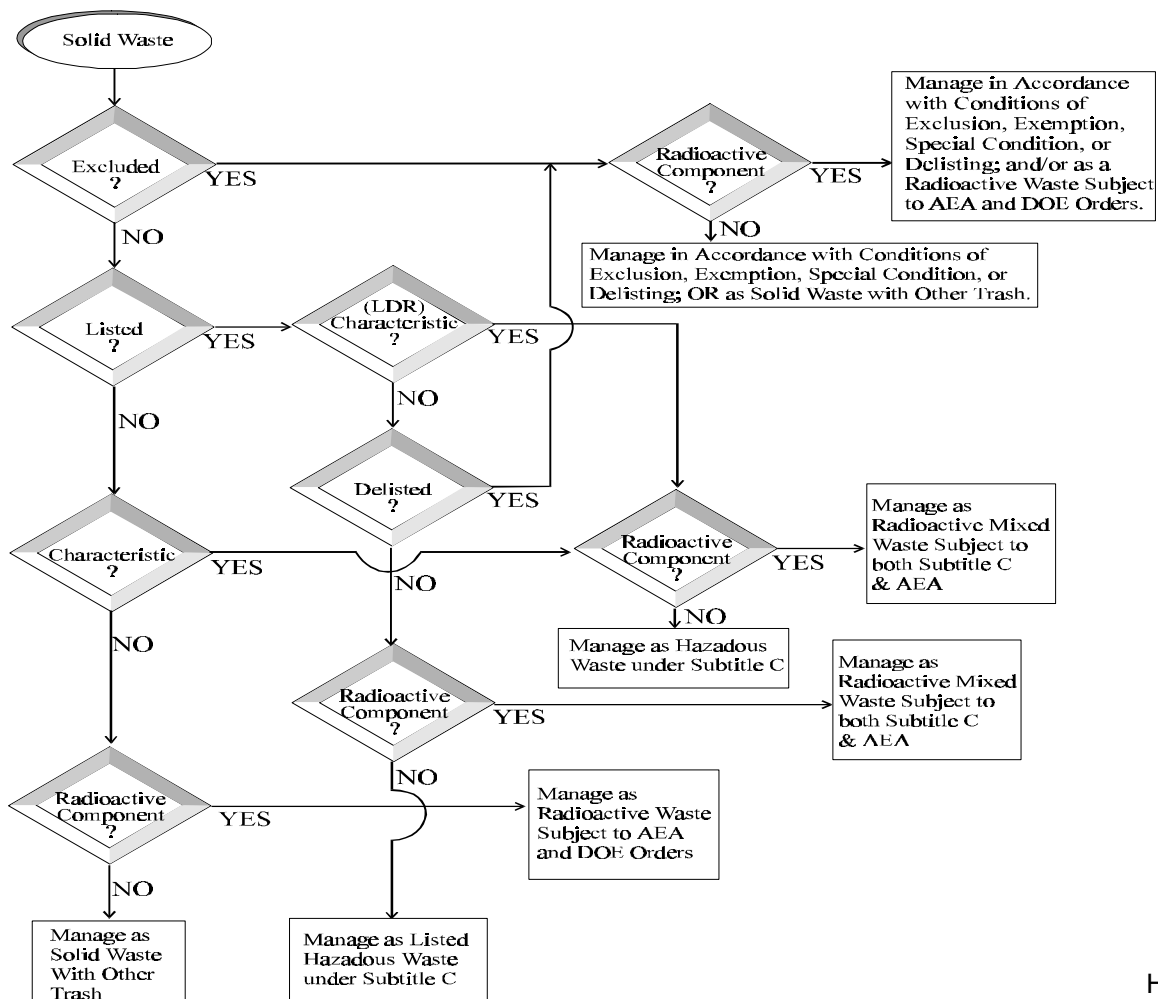
Generators conducting a hazardous waste determination must ALSO:

- **Determine whether waste is prohibited**
- **Identify all applicable listings and characteristic waste codes**
- **Identify UHCs that are reasonably expected to be present**
- **Determine and meet the most stringent treatment standard(s) prior to land disposal**

In addition, the additional waste characterization responsibilities listed above, generators and TSDFs must ensure their waste management strategies reflect the LDR dilution and *storage prohibitions*.

Let's Go Back to the *Steps*

- Is the waste *excluded*?
- Is the waste *listed*?
 - Is is a mixture of solid waste and listed hazardous waste?
 - Is it derived from the treatment, storage, or disposal of a listed hazardous waste?
 - Does it contain a listed hazardous waste?
- Is the waste a characteristic hazard?



Exclusions, Exemptions, and Special Conditions

- ***Conditionally exempt small quantity generators***
- **Materials that are NOT regulated**
- **Recyclable materials**
- **Universal wastes**
- **Residues in “empty” containers**
- **Delisting**

Generators of less than 100 kg of hazardous waste in a calendar month are subject to special requirements. Briefly, these requirements include:

- performing the generator's hazardous waste determination,
- complying with accumulation limits, and
- managing the wastes, either on-site or off-site, in an appropriate type of unit.

Provided these conditions are met, the generators qualify as conditionally exempt small quantity generators (CESGQs) and their wastes are not subject to Subtitle C regulation. (***40 CFR 261.5***)

Materials that are NOT Subject to Hazardous Waste Regulations

- **Waste remaining in the unit in which it was generated**
- **Specific wastes**
- **PCBs**
- **Sample/Treatability exclusion**
- **Mixture rule exemptions**
- **“Derived from” exemptions**

Waste still in the unit in which it was generated - Material is not viewed as hazardous waste until it exits the unit. There are two exceptions to this rule and they include:

- the unit is a surface impoundment, and
- the material remains in the unit more than 90 days after the unit ceases to operate. [***40 CFR 261.4(c)***]

Specific waste -- These wastes are regulated as solid wastes under RCRA.

PCBs - These are generally regulated under the Toxic Substances Control Act (TSCA), but may be prohibited from land disposal if they are combined with liquid hazardous waste (either prior to or after the hazardous waste is generated).

Samples - Samples of solid waste, water, soil, debris, or air (contained) that are collected for testing (analysis or treatability testing) are not subject to RCRA requirements.

Mixture rule exemptions - Some mixtures of small amounts of listed wastes and wastewaters are exempt from RCRA requirements.

“Derived-from” exemptions - Some reclaimed materials, waste pickle liquor sludges, and wastes from burning recyclable materials are excluded from RCRA regulation.

***Specific Solid Wastes NOT Considered
Hazardous Waste
[40 CFR 261.4(b)]***

- **Household waste**
- **Waste returned to the soil or used as fertilizer**
- **Mining overburden**
- **Waste from combustion of fossil fuels**
- **Wastes from exploration, development, or production of crude oil, natural gas, or geothermal energy**
- **Waste with trivalent chromium**
- **Waste from the extraction, beneficiation, and processing of ores and minerals**

The **specific wastes** listed above and on the next page are solid wastes but not hazardous wastes. Many of these wastes are generated and managed by specific industries in large volumes and the wastes have relatively low hazards, as compared to other hazardous wastes. Most of these wastes are typically recycled. Some of these wastes are generated and managed by DOE including waste from combustion of fossil fuels, wastes from fossil fuel development and production, and chlorofluorocarbons.

Although not listed above, ***PCB-containing dielectric fluid*** and electric equipment containing such fluid are exempt from Subtitle C regulation provided they are hazardous only because they exhibit the characteristic of toxicity for one or more organic constituents. (***40 CFR 261.8***)

Specific Solid Wastes NOT Considered Hazardous Waste (Continued)

- ***Cement kiln dust***
- Discarded arsenical-treated wood or wood products
- Petroleum-contaminated media/debris subject to UST corrective action
- Reinjecting groundwater
- Used chlorofluorocarbon refrigerant from totally enclosed heat transfer equipment
- ***Non-terne plated , hot drained, used oil filters***
- Used oil re-refining distillation bottoms used as a feedstock

Sample/Treatability Exclusion

- **The sample/treatability exclusions apply to waste that will be analyzed or treated and include:**
 - **Solid waste, water, soil, or air collected for testing to determine its characteristics or composition**
 - **Samples collected for treatability studies**
 - **Samples undergoing treatability studies**

The sample exclusion (**40 CFR 261.4(d)**) was crafted to allow generators to send their waste to an off-site laboratory to determine its characteristics or composition.

Treatability studies are studies in which a hazardous waste is subjected to a treatment process to determine:

- whether the waste is amenable to the treatment process
- if pretreatment is required
- optimal process conditions
- the efficiency of the treatment process
- the characteristics and volume of residuals

The exclusion applies to the collection, preparation, storage, and transportation of the sample. When the sample is no longer needed for testing or analysis, it again becomes subject to regulation. The quantity limits for the generators and the laboratory or testing facility are:

10,000 kg non-acute hazardous waste (total)

- 1,000 kg non-acute hazardous waste (non-media/debris)
- 1 kg acute hazardous waste (non-media/debris)
- 10,000 kg contaminated media or debris contaminated with hazardous waste, including 2,500 kg contaminated with acute hazardous waste.
- (**40 CFR 261.4(e)**)

Laboratories and testing facilities likewise are not subject to RCRA requirements (e.g., obtaining a hazardous waste storage permit) provided certain notification and reporting requirements, storage, and quantity limitations are achieved. (**40 CFR 261.4(f)**)

Mixture Rule Exemptions [40 CFR 261.3(a)(iv)]

- **Wastewater discharges regulated under the CWA provided:**
 - **Spent solvent** concentrations do not exceed 1 ppm or 25 ppm dependent on the type of listed solvent
 - Heat exchanger bundle cleaning sludge from petroleum refining industry (K050)
 - De minimis losses of **commercial chemical products** or chemical intermediates
 - Wastewaters from laboratory operations containing toxic wastes

Industrial processes often result in mixtures of small amounts of **listed** wastes with large amounts of wastewaters resulting in low concentrations of toxicants.

Wastewater exemption applies to mixtures managed in wastewater treatment systems the discharge of which is regulated under the Clean Water Act (CWA).

Exemptions are provided for:

- solvents at concentrations that do not exceed:
 - 1 ppm for carcinogenic solvents (i.e., carbon tetrachloride, tetrachlorethylene, trichloroethylene)
 - 25 ppm for toxic solvents (e.g., methylene chloride, cresols, toluene)
- heat exchanger bundle cleaning sludge from petroleum refining industry (K050)
- de minimis losses of commercial chemical products or chemical intermediates
- wastewaters from laboratory operations containing toxic wastes provided the laboratory's flow does not exceed 1 percent of the facility's total flow, or the concentration does not exceed 1 ppm in the headworks

“Derived-from” Rule Exemptions
[40 CFR 261.3(c)(ii)]

- **Materials that are reclaimed from solid wastes and used beneficially**
- **Waste pickle liquor sludge**
- **Wastes from burning certain recyclable materials that are exempted from regulation**
- **Certain nonwastewater residues resulting from high temperature metals recovery (HTMR)**
- ***Hazardous debris* that has been treated using prescribed technology and no longer exhibit a characteristic of a hazardous waste**

Certain solid wastes are not hazardous even though they are generated from the treatment, storage, or disposal of a listed hazardous waste, provided they do not exhibit one or more of the characteristics of hazardous waste. These exempt wastes include:

- Materials that are reclaimed from hazardous wastes and used beneficially. These are considered products, not wastes. Examples are:
 - recovered solvents, and
 - reclaimed metals.

The exemption does not apply to reclaimed materials that are used in a manner constituting disposal or are burned for energy recovery, unless that is the recovered material's normal manner of use.

- Waste pickle liquor sludge generated by lime stabilization of spent pickle liquor from the iron and steel industry.
- Wastes from burning certain fuels produced from oil-bearing hazardous wastes from petroleum refining, production, or transportation, which are themselves exempt from regulation
- Nonwastewater residues (e.g., slag) from HTMR processing of K061, K062, or F006 waste in specified units.
- Hazardous debris or debris that has been treated using a specified technology and does not exhibit a characteristic

Requirements for *Hazardous Wastes That Are Recycled*

- **Recyclable materials** subject to 40 CFR Part 266
 - Materials used in a manner constituting disposal
 - Hazardous waste burned for energy recovery
 - Used oil burned for energy recovery (*OR 40 CFR 279*)
 - Materials from which precious metals are reclaimed
 - Spent lead-acid batteries being reclaimed
- **Recyclable materials exempt from regulation**
 - Industrial ethyl alcohol being reclaimed
 - Used batteries returned to a battery manufacturer for regeneration
 - Scrap metal
 - Materials (fuels, reclaimed oil, or hazardous waste fuel) associated with petroleum refining production, or transportation
 - Used oil that is recycled and is also hazardous solely because it exhibits a hazardous characteristic (*OR 40 CFR 279*)

Hazardous waste that are recycled are defined as recyclable materials. **Recyclable materials** that are hazardous wastes are subject to generator, transporter, and storage requirements unless otherwise specified under 40 CFR 261.6. Some of them are regulated under 40 CFR Part 266. In addition, some recyclable materials are exempt from regulation.

Dependent on State-specific regulations, **used oil** that is hazardous waste solely because it exhibits a characteristic of hazardous characteristic is exempt from regulation when recycled in some manner other than burning for energy recovery. At the Federal level; however, although it is exempt from hazardous waste regulations, management standards specified under **40 CFR Part 279** apply. The prescribed standards apply to generators, transporters, collectors, and processors of used oil. The requirements include notification, tracking of used oil, and general facility standards.

Universal Wastes

- **Batteries**
- **Pesticides**
- **Mercury-containing thermostats**

EPA published the final Universal Waste Rule in the *May 11, 1995 Federal Register*. (60 FR 25492) Wastes that qualify as universal wastes are subject to a simplified set of requirements set forth in a new *40 CFR Part 273*. Generators performing their hazardous waste determination should determine whether the material meets one of the material-specific definitions. These include:

- **Battery** - encompasses all battery types and sizes and means a device consisting of one or more electrically connected cells (anode, cathode, and electrolyte as well as necessary connections) which is designed to receive, store, and deliver electricity. This definition includes batteries from which electrolyte has been removed.
- **Pesticide** is any substance intended for preventing, destroying, repelling, or mitigating any pest, or intended for use as a plant regulator, defoliant, or desiccant.
- **Thermostat** means a temperature control device that contains metallic mercury in an ampule attached to a bimetal sensing element, and mercury-containing ampules that have been removed from temperature control devices.

When deciding whether a particular material should be managed under the simplified provisions, generators must ensure that the Universal Waste Rule has been adopted by both their State and the consignment State.

Are Containers that Held Hazardous Waste Also Hazardous? (40 CFR 261.7)



- **Empty containers** are not hazardous

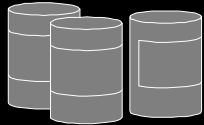


- **Containers are empty** (except those that held acute hazardous waste) if:

- emptied by conventional methods AND
- no more than 2.5 cm of residue,
- 3% by weight if less than or equal to 110 gal in size, or
- 0.3% weight (total capacity) if greater than 110 gal.

EPA has issued some interesting policy letters regarding empty containers. First, an empty container is one that has been emptied by all conventional means, not just one. Second, empty containers that contained ignitable wastes and produce a sufficient quantity of vapor to have a flash point <140°F are hazardous wastes. Thus, under RCRA, even determining when a container is empty may be subject to interpretation.

Are Containers Hazardous? (Continued) (40 CFR 261.7)



- **Containers that held acute hazardous waste are empty if:**
 - they have been triple rinsed with an appropriate solvent
 - they have been cleaned by an alternative method demonstrated in the scientific literature
 - the container liner that prevented contact between the product and the container has been removed

Because acute hazardous wastes pose a greater risk to human health and the environment than non-acute hazardous waste, the criteria for emptying containers that held acute hazardous wastes are more stringent. Inner liners and rinsate generated while emptying such containers typically will be defined as acute hazardous waste. Once defined as empty in accordance with the governing criteria, containers are no longer regulated under Subtitle C and may be re-used or disposed.

Delisting (**40 CFR 260.22**)



- **Is a regulatory process**
- **Requires petitioning the appropriate EPA Regional Office or State**
- **Requires demonstrating that:**
 - **the waste produced by a particular facility does not meet the criteria for its waste category**
 - **no other constituents are present that might require that the waste be regulated as hazardous**

Delisting is one way out of the hazardous waste arena. It is, however, not a simple path. It is a regulatory process requiring public comment and resulting in a modification of the *CFR*. The process requires approximately 2 years although an EPA notice [**June 25, 1996 *Federal Register*** (61 *FR* 32798)] delegating the hazardous waste delisting authority to EPA's ten Regional offices may help to expedite the process. **Appendix IX, 40 CFR 261**, contains a list of wastes that have been excluded from regulation. The delisting is waste- and site-specific; therefore, one facility's delisting petition does not allow another facility to claim an exclusion from regulation. However, a Regional delisting decision will be applicable in all states not currently authorized for delisting, regardless of the EPA Region in which the facility is located. (61 *FR* 32799)

Changing Definition of Hazardous Waste

- **Additional listings**
- **Additional criteria**
- **New or revised exclusions**
- **Hazardous Waste Identification Rule (HWIR)**

The definition of hazardous waste changes over time as the RCRA statute is amended and EPA promulgates new regulations. In some cases, the changes are minor, such as when new listings or exclusions are added. In other cases, there may be major changes to the definition.

EPA's changes to the toxicity characteristic had a major impact on DOE's waste management program. In the future, EPA is slated to finalize two proposed Hazardous Waste Identification Rules (HWIR) -- *HWIR-waste* and *HWIR-media*. These rules will correct some of the current inequities in the hazardous waste definition.

Definition of Hazardous Waste in Summary

- The definition of hazardous waste begins with the **solid waste definition**.
- EPA has established a **hierarchy** for performing the hazardous waste determination which includes:
 - Determining if the waste is excluded;
 - Determining whether the waste meets a listing
 - Determining whether the waste exhibits a characteristic
 - To ensure compliance with LDR, determining whether listed wastes also exhibit any characteristics
- Listed waste include the F-, K-, P- and U-listed waste
- There are four characteristics including ignitability, corrosivity, reactivity, and toxicity (D001-D043).
- Mixed waste is the smallest subset of the universe of materials.

Self-Assessment Questions: Definition of Hazardous Waste Module

I. Circle the correct answer(s).

1. Which term(s) is most directly associated with RCRA Subtitle C?
 - a. Hazardous Waste
 - b. Hazardous Substance
 - c. Hazardous Materials
 - d. None of the above
2. Mixed waste consists of:
 - a. A unique blend of rocks, rubble, and soil
 - b. Waste that contains both hazardous waste and source, special nuclear, or by-product material subject to AEA
 - c. Trash that is contaminated with a radioactive component
 - d. A contaminated sludge
3. When conducting hazardous waste determinations, generators must consider:
 - a. Exclusions from regulation
 - b. Listings of hazardous waste
 - c. Characteristic exhibited
 - d. All of the above
4. How many “listed” wastes are found in the 40 CFR part 261?
 - a. Five
 - b. One
 - c. Four
 - d. None
5. The contained-in principal was initially crafted to address:
 - a. Contaminated lead bricks
 - b. Ground water contaminated with tritium
 - c. Contaminated environmental media
 - d. Products (e.g., thermostats) that have elemental mercury components
6. From a regulatory standpoint, both listed and characteristic wastes are subject to the mixture and derived-from rules, and the contained-in policy. From a practical standpoint, however, which types of waste are subject to the mixture and derived-from rules, and the contained-in policy?
 - a. Ignitable and corrosive wastes
 - b. Waste that exhibits any characteristic of hazardous waste
 - c. Listed wastes
 - d. Both listed and characteristic waste
7. When disposing of compressed gas, generators performing their hazardous waste determination must rely on regulations issued by:
 - a. Occupational Safety and Health Administration
 - b. Department of Interior, Bureau of Mines
 - c. Department of Transportation
 - d. Department of Energy
8. The applicability of LDR requirements must be determined:
 - a. At the end of the day
 - b. At a waste’s initial point of generation
 - c. By solid waste disposal facilities
 - d. The first day of each month

Self-Assessment Questions: Definition of Hazardous Waste Module

9. Laboratory operations from which toxic wastes are rinsed down the drain to their local publicly owned treatment works (POTW) may be:
 - a. In big trouble
 - b. Threatening wildlife receptors
 - c. Destroying their sanitary lines
 - d. Exempt from Subtitle C regulation
10. Fifty-five (55) gallon containers that previously held P-listed hazardous waste and that have been fully drained but still contain some residual liquid [less than 1 inch (2.5 cm)] are:
 - a. Exempt from regulation
 - b. Rusting very quickly
 - c. Fully regulated as hazardous waste
 - d. Scrap metal

II. Complete the statement.

1. Listed wastes that may be generated at any number of locations under a variety of conditions include the ____-listed wastes.
2. Four characteristics of hazardous waste are:
 - a. _____
 - b. _____
 - c. _____
 - d. _____
3. Corrosive wastes include aqueous solutions with a _____.
4. If the concentration of certain constituents in an extract _____ an applicable toxicity characteristic threshold, the waste is hazardous waste.
5. TSDFs verify compliance with the applicable treatment standard(s) by either _____ the waste and comparing the results against the EPA-established concentration(s), or ensuring the _____ was applied.
6. Unlike listed wastes, wastes that are hazardous only because they exhibit a characteristic may be sent to a _____ once treated to meet all applicable treatment standards.
7. LDR treatability groups may be viewed as consisting of certain _____, _____ within those waste codes, and _____.
8. Regulatory citations that set forth and must be observed when identifying applicable LDR treatment standards include _____ and _____.
9. Samples that are sent for treatability studies as well as the testing facilities/laboratories managing the samples are _____ RCRA Subtitle C provided certain conditions are met.

Self-Assessment Questions: Definition of Hazardous Waste Module

III. Complete the matching set.

- | | |
|--|--|
| ___ 1. Unused commercial chemical products | a. D003 |
| ___ 2. Ignitable waste | b. Spent solvents (F001-F005) |
| ___ 3. Characteristics based on exceeding threshold concentrations | c. Flash point of less than 60°C (140°F) |
| ___ 4. Underlying hazardous constituents | d. P- and U-listed materials |
| ___ 5. May be exempt from Subtitle C | e. Reactive wastes |
| | f. Bright Line |
| | g. D004-D043 |
| | h. Recyclable materials |
| | i. 40 CFR 268.48 |

Self-Assessment Answers: Definition of Hazardous Waste Module

I. Circle the correct answer(s).

1. Which term(s) is most directly associated with RCRA Subtitle C? [See HW-2]
a. **Hazardous Waste** c. Hazardous Materials
b. Hazardous Substance d. None of the above
2. Mixed waste consists of: [See HW-3]
a. A unique blend of rocks, rubble, and soil c. Trash that is contaminated with a radioactive component
b. **Waste that contains both hazardous waste and source, special nuclear, or by-product material subject to AEA** d. A contaminated sludge
3. When conducting hazardous waste determinations, generators must consider: [See HW-4]
a. Exclusions from regulation c. Characteristic exhibited
b. Listings of hazardous waste d. **All of the above**
4. How many “listed” wastes are found in the 40 CFR part 261? [See HW-6,7]
a. Five c. **Four**
b. One d. None
5. The contained-in principal was initially crafted to address: [See HW-14]
a. Contaminated lead bricks c. **Contaminated environmental media**
b. Ground water contaminated with tritium d. Products (e.g., thermostats) that have elemental mercury components
6. From a regulatory standpoint, both listed and characteristic wastes are subject to the mixture and derived-from rules, and the contained-in policy. From a practical standpoint, however, which types of waste are subject to the mixture and derived-from rules, and the contained-in policy? [See HW-6,12,13, 14]
a. Ignitable and corrosive wastes c. **Listed wastes**
b. Waste that exhibits any characteristic of hazardous waste d. Both listed and characteristic waste
7. When disposing of compressed gas, generators performing their hazardous waste determination must rely on regulations issued by: [See HW-16]
a. Occupational Safety and Health Administration c. **Department of Transportation**
b. Department of Interior, Bureau of Mines d. Department of Energy
8. The applicability of LDR requirements must be determined: [See HW-24]
a. At the end of the day c. By solid waste disposal facilities
b. **At a waste’s initial point of generation** d. The first day of each month
9. Laboratory operations from which toxic wastes are rinsed down the drain to their local publicly owned treatment works (POTW) may be: [See HW-34]

Self-Assessment Answers: Definition of Hazardous Waste Module

- a. In big trouble
 - b. Threatening wildlife receptors
 - c. Destroying their sanitary lines
 - d. **Exempt from Subtitle C regulation**
10. Fifty-five (55) gallon containers that previously held P-listed hazardous waste and that have been fully drained but still contain some residual liquid [less than 1 inch (2.5 cm)] are: [See HW-38, 39]
- a. Exempt from regulation
 - b. Rusting very quickly
 - c. **Fully regulated as hazardous waste**
 - d. Scrap metal

II. Complete the statement.

1. Listed wastes that may be generated at any number of locations under a variety of conditions include the **F**-listed wastes. [See HW-8]
2. Four characteristics of hazardous waste are: [See HW-6, 15]
 - a. **Ignitability**
 - b. **Corrosivity**
 - c. **Reactivity**
 - d. **Toxicity**
3. Corrosive wastes include aqueous solutions with a **pH ≤ 2 or ≥ 12.5**. [See HW-17]
4. If the concentration of certain constituents in an extract **equals or exceeds** an applicable toxicity characteristic threshold, the waste is hazardous waste. [See HW-20, 21]
5. TSDFs verify compliance with the applicable LDR treatment standard(s) by either **analyzing** the waste and comparing the results against the EPA-established concentration(s), or ensuring the **specified technology** was applied. [See HW-24]
6. Unlike listed wastes, wastes that are hazardous only because they exhibit a characteristic may be sent to a **Subtitle D** once treated to meet all applicable treatment standards. [See HW-24]
7. LDR treatability groups may be viewed as consisting of certain **waste code(s)**, **treatability subcategories** within those waste codes, and **waste forms**. [See HW-25]
8. Regulatory citations that set forth and must be observed when identifying applicable LDR treatment standards include **40 CFR 268.40** and **40 CFR 268.48**. [See HW-25, 26]
9. Samples that are sent for treatability studies as well as the testing facilities/laboratories managing the samples are **exempt from** RCRA Subtitle C provided certain conditions are met. [See HW-33]

Self-Assessment Answers: Definition of Hazardous Waste Module

III. Complete the matching set.

- | | |
|---|--|
| <u>d</u> 1. Unused commercial chemical products [See HW-10] | a. D003 |
| <u>c</u> 2. Ignitable waste [See HW-16] | b. Spent solvents (F001-F005) |
| <u>g</u> 3. Characteristic waste code(s) based on exceeding threshold concentrations [See HW-20] | c. Flash point of less than 60°C (140°F) |
| <u>i</u> 4. Underlying hazardous constituents [See HW-26] | d. P- and U-listed materials |
| <u>h</u> 5. May be exempt from Subtitle C [See HW-33] | e. Reactive wastes |
| | f. Bright Line |
| | g. D004-D043 |
| | h. Recyclable materials |
| | i. 40 CFR 268.48 |

DEFINITION OF HAZARDOUS WASTE MODULE STATUTORY-REGULATORY CITATION/KEY WORD INDEX

Statutory/Regulatory Citations

<u>Citation(s)</u>	<u>Page Number(s)</u>
40 CFR 261, Appendix VIII	HW-2
40 CFR 261, Appendix IX	HW-40
40 CFR 260.22	HW-4, 40
40 CFR 261.3(a)	HW-12, 34
40 CFR 261.3(c)	HW-13, 24, 35
40 CFR 261.3(f)(2)	HW-14
40 CFR 261.4(b)	HW-31
40 CFR 261.4(c)	HW-30
40 CFR 261.4(d)	HW-33
40 CFR 261.4(e)	HW-33
40 CFR 261.4(f)	HW-33
40 CFR 261.5	HW-29
40 CFR 261.6	HW-36
40 CFR 261.7	HW-38-39
40 CFR 261.8	HW-31
40 CFR 261.21	HW-16
40 CFR 261.22	HW-17
40 CFR 261.23	HW-18
40 CFR 261.24	HW-20
40 CFR 261.31	HW-8
40 CFR 261.32	HW-9
40 CFR 261.33	HW-10
40 CFR Part 261, Subpart C	HW-6, 15
40 CFR Part 261, Subpart D	HW-6, 7
40 CFR 262.11	HW-4
40 CFR 268.2	HW-26
40 CFR 268.48	HW-25
40 CFR Part 268, Subpart D	HW-26
40 CFR 273	HW-37
40 CFR 279	HW-36
40 CFR Part 302	HW-2
RCRA Subtitle C	HW-3
RCRA Subtitle D	HW-3
RCRA Subtitle I	HW-3

Alphabetical Listing

Key Word(s)

Acute hazardous waste	HW-10-11, 30, 36
Best demonstrated available technologies (BDAT)	HW-24, 26
Characteristics of hazardous waste	HW-6, 16, 24, 27
Conditionally exempt small quantity generators	HW-26
Corrosive waste	HW-18, 25
D001	HW-17, 25
D002	HW-18, 25
D003	HW-19
D004-D043	HW-22
Delisting	HW-37
Dilution	HW-12, 27
Discarded	HW-10
Discarded commercial chemicals	HW-7, 10, 11
Exclusions from Def. of HW	HW-24-33
Exemptions from Def. of HW	HW-24-33
F-listed wastes	HW-7, 8
Hazardous debris	HW-14, 32
Hazardous and Solid Waste Amendments (HSWA)	HW-23
Hazardous constituents	HW-2
Hazardous material	HW-2
Hazardous substance	HW-2
Hazardous waste	HW-2, 3, 4, 5, 7, 16, 38
Hazardous waste determination	HW-4, 24, 27
Hazardous Waste Identification Rule (HWIR)	HW-41
Ignitable waste	HW-6, 16, 25
K-listed wastes	HW-7, 9
Land disposal restrictions (LDR)	HW-12, 23-27
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Spill residue	HW-10
Storage prohibition	HW-27
Toxic waste	HW-11
Toxicity characteristic (TC)	HW-20, 21, 25
Toxicity characteristic leaching procedure (TCLP)	HW-20
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Universal treatment standard (UTS)	HW-25
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Waste codes	HW-6, 24, 26, 27
Waste still in the unit in which it was generated	HW-30
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“Contained-in” principle	HW-14
“Derived-from” exemptions	HW-30, 35
“Derived-from” wastes	HW-4, 13
“Empty” containers	HW-38, 39
“Reasonably expected to be present”	HW-25
“Spent” materials	HW-8

Definition of Hazardous Waste Module Cross-Links

Module Page/Line	Cross-Link Language	Resource/Document
HW-2/Slide, Line 1	"Hazardous"	"Hazardous" Terminology; DOE/EH-231-003/0191; http://tis-nt.eh.doe.gov/oepa/cercla/hazterms.pdf
HW-3/Notes, Line 7	"Subtitle I"	Automated Underground Storage Tank Guidance (Macintosh Version); http://tis-nt.eh.doe.gov/oepa/programs/ust.html
HW-3/Notes, Line 12	"Subtitle D"	Solid Waste Landfills Under RCRA Subtitle D, DOE/EH-0512; [not available on OEPA Website]
HW-3/Notes, Line 13	"solid waste"	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-3/Notes, Line 14	"Subtitle C"	OEPA Environmental Law Summary: Resource Conservation and Recovery Act; http://tis-nt.eh.doe.gov/oepa/law_sum/RCRA.HTM
HW-3/Notes, Line 18	"Mixed waste"	EPA Mixed Waste Team Home Page; http://www.epa.gov/radiation/mixed-waste/index.html#general

HW-4/Slide, Line 1	“Overview”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-4/Notes, Line 1	“solid waste”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-4/Notes, Line 8	“delisted”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-4/Notes, Line 11	“40 CFR 262.11”	National Archives and Record Administration “Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-4/Notes, Line 11	“generators”	Hazardous Waste Generator Requirements, DOE/EH-231-055/1194 (Revised August 1997); http://tis-nt.eh.doe.gov/oepa/guidance/rcra/gener_rv.pdf
HW-4/Notes, Line 15	“excluded”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-4/Notes, Lines 17-18	“ waste meets a listing”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-4/Notes, Line 19	“Waste exhibits a characteristic”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-6/Notes, Line 1	“Subpart D of 40 CFR Part 261”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-6/Notes, Line 2	“Subpart C (of 40 CFR Part 261)”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-6/Notes, Line 13	“mixture”	The Mixture Rule Under the Resource Conservation and Recovery Act, DOE/EH-231-005/0991; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/mixture.pdf
HW-6/Notes, Line 13	“derived from”	The “Derived-from” Rule under the Resource Conservation and Recovery Act, DOE/EH-231-035/0693; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/derived.pdf
HW-6/Notes, Line 13	“contained in”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf

HW-7/Slide, Line 1	“Listed Hazardous Wastes”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-7/Notes, Line 2	“F-listed wastes”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-7/Notes, Line 6	“K-listed wastes”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-7/Notes, Line 12	“P-listed wastes”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-7/Notes, Line 17	“U-listed wastes”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-8/Slide, Line 1	“(F-listed)”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-8/Slide, Line 3	“40 CFR 261.31”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-8/Notes, Line 6	“spent”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-9/Slide, Line 3	“40 CFR 261.32”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-10/Slide, Line 1	“(P- and U-listed)”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-10/Slide, Line 3	“40 CFR 261.33”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html

HW-11/Slide, Line 3	““P” List”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-11/Slide, Line 7	““U” List”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-11/Notes, Line 3	“[40 CFR 261.33(e)]”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-11/Notes, Line 5	“[40 CFR 261.33(f)]”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-12/Slide, Line 1	“Mixture Rule”	The Mixture Rule Under the Resource Conservation and Recovery Act, DOE/EH-231-005/0991; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/mixture.pdf
HW-12/Slide, Line 2	“[40 CFR 261.3(a)]”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-12/Notes, Line 2	“ <u>mixed waste</u> ”	Mixed Waste Focus Area; http://wastenot.inel.gov/mwfa/index.html
HW-12/Notes, Line 10	“Land disposal restrictions (LDR)”	LDR Program Overview, DOE/EH-231/005-0293; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ldr-over.pdf
HW-13/Slide, Line 1	“Derived-From”	The “Derived-from” Rule under the Resource Conservation and Recovery Act, DOE/EH-231-035/0693; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/derived.pdf
HW-13/Slide, Line 2	“[40 CFR 261.3(c)]”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-13/Slide, Line 4	“solid waste”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-13/Notes, Line 1	“ <u>listed</u> ”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-13/Notes, Line 4	“ <u>characteristic</u> ”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf

HW-14/Notes, Line 1	“contained-in policy”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-14/Notes, Line 4	“mixture rule”	The Mixture Rule Under the Resource Conservation and Recovery Act, DOE/EH-231-005/0991; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/mixture.pdf
HW-14/Notes, Line 19	“[40 CFR 261.3(f)(2)]”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-15/Slide, Line 1	“Hazardous Waste Characteristics”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-15/Notes, Line 2	“40 CFR 261 Subpart C”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-16/Slide, Line 1	“Ignitable Hazard”	Ignitable, Corrosive, Reactive, and Incompatible Wastes; DOE/EH-231-054/1294; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ignit.pdf
HW-16/Slide, Line 1	“(40 CFR 261.21)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-16/Slide, Line 2	“D001”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-17/Slide, Line 1	“Corrosive Characteristic”	Ignitable, Corrosive, Reactive, and Incompatible Wastes; DOE/EH-231-054/1294; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ignit.pdf
HW-17/Slide, Line 1	“(40 CFR 261.22)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-17/Slide, Line 2	“D002”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-18/Slide, Line 1	“Reactive Characteristic”	Ignitable, Corrosive, Reactive, and Incompatible Wastes; DOE/EH-231-054/1294; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ignit.pdf
HW-18/Slide, Line 2	“(40 CFR 261.23)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-18/Slide, Line 3	“D003”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html

HW-19/Slide, Line 1	“Reactive Characteristic”	Ignitable, Corrosive, Reactive, and Incompatible Wastes; DOE/EH-231-054/1294; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ignit.pdf
HW-20/Slide, Line 1	“Toxicity Characteristic”	Questions and Answers on the RCRA Toxicity Characteristic; DOE/EH-231-002/0191 [NOT available on OEPA Website]
HW-20/Slide, Line 2	“(40 CFR 261.24)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-20/Slide, Line 3	“D004-D043”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-20/Slide, Line 10	“SW-846”	“DOE Methods for Evaluating Environmental and Waste Management Samples”; http://www.pnl.gov/methods/index.html
HW-21	N/A	N/A
HW-22	N/A	N/A
HW-23/Slide, Line 1	“Objective of LDR”	LDR Program Overview, DOE/EH-231/005-0293; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ldr-over.pdf
HW-23/Notes, Line 2	Hazardous and Solid Waste Amendments (HSWA)	OEPA Environmental Law Summary: Resource Conservation and Recovery Act; http://tis-nt.eh.doe.gov/oepa/law_sum/RCRA.HTM
HW-24/Slide, Line 1	“LDR Summary”	LDR Program Overview, DOE/EH-231/005-0293; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ldr-over.pdf
HW-25/Slide, Line 2	“Land Dispose”	LDR Program Overview, DOE/EH-231/005-0293; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ldr-over.pdf
HW-25/Slide, Line 5	“BDAT”	Complying with LDRs for Contaminated Soil & Debris, DOE/EH-231-002/0191; http://tis-nt.eh.doe.gov/oepa/guidance/cercla/soildbrs.pdf
HW-25/Notes, Line 3	“40 CFR 268.40”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-25/Notes, Line 15	“(40 CFR 268.2)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-25/Notes, Line 16	“Special considerations”	LDR Program Overview, DOE/EH-231/005-0293; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/ldr-over.pdf
HW-25/Notes, Line 20	“radioactive lead solids”	Information — Lead and Lead Products Contaminated with Radioactive Material; dated June 27, 1997; http://tis-nt.eh.doe.gov/oepa/guidance/aea/lead.pdf

HW-26/Slide, Line 3	“40 CFR 268.48”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-26/Notes, Line 16	“September 19, 1994 (Phase II) FR”	Federal Register Online via GPO Access; http://www.access.gpo.gov/su_docs/aces/aaces002.html
HW-26/Notes, Line 19	“(60 FR 43654)”	DOE Consolidated Comments - 60 FR 43654, "Land Disposal Restrictions--Phase IV: Issues Associated With Clean Water Act Treatment Equivalency, and Treatment Standards for Wood Preserving Wastes and Toxicity Characteristic Metal Wastes"; http://tis-nt.eh.doe.gov/oepa/comments/rcra/ldr4-cmt.pdf
HW-27/Slide, Line 1	“Generators”	Hazardous Waste Generator Requirements, DOE/EH-231-055/1194 (Revised August 1997); http://tis-nt.eh.doe.gov/oepa/guidance/rcra/gener_rv.pdf
HW-27/Notes, Line 3	“storage prohibitions”	Waste Management and the Land Disposal Restriction Storage Prohibition; DOE/EH-231-011/0592; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/storage.pdf
HW-28/Slide, Line 1	“Steps”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-28/Slide, Line 2	“excluded	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-28/Slide, Line 3	“listed”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf
HW-29/Slide, Lines 1	“Exclusions, Exemptions”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-29/Slide, Lines 3-4	“Conditionally exempt small quantity generators”	Hazardous Waste Generator Requirements; DOE/EH-231-055/1194; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/gener_rv.pdf
HW-29/Notes, Line 9	“(40 CFR 261.5)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html

HW-30/Slide, Lines 1-2	“Materials that are NOT Subject to Hazardous Waste Regulations”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-30/Notes, Line 1	“Wastes still in the unit”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-30/Notes, Line 6	“[40 CFR 261.4(c)]”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-30/Notes, Line 7	“Specific waste”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-30/Notes, Line 8	“PCBs”	DOE Environmental Guidance - Toxic Substances Control Act; http://tis-nt.eh.doe.gov/oepa/guidance/tsca.htm
HW-30/Notes, Line 15	“Mixture rule exemptions”	The Mixture Rule Under the Resource Conservation and Recovery Act, DOE/EH-231-005/0991; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/mixture.pdf
HW-30/Notes, Line 17	“Derived-from exemptions”	The “Derived-from” Rule under the Resource Conservation and Recovery Act, DOE/EH-231-035/0693; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/derived.pdf
HW-31/Slide, Lines 1-2	“Specific Solid Wastes NOT Considered Hazardous Waste”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-31/Slide, Line 3	“40 CFR 261.4(b)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-31/Notes, Line 8	“PCB-containing dielectric fluid”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-31/Notes, Line 11	“(40 CFR 261.8)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html

HW-32/Slide, Lines 1-2	“Specific Solid Wastes NOT Considered Hazardous Waste”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-32/Slide, Line 3	“Cement kiln dust”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-32/Slide, Line 11	Non-terne plated, hot-drained, used oil filters”	Used Oil Final Rule and Correction Notices Issued; Environmental Guidance Regulatory Bulletin dated October 31, 1993 [NOT available on the OEPA Website]
HW-33/Slide, Line 1	“Sample”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcradef.html
HW-33/Slide, Line 1	“Treatability”	Treatability Study Sample Exemption—Update; EH-413-071/0197; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/treat-ib.pdf
HW-33/Notes, Line 1	“40 CFR 261.4(d)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-33/Slide, Line 20	“40 CFR 261.4(e)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-33/Slide, Line 24	“40 CFR 261.4(f)”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-34/Slide, Line 1	“Mixture Rule Exemptions”	The Mixture Rule Under the Resource Conservation and Recovery Act, DOE/EH-231-005/0991; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/mixture.pdf
HW-34/Slide, Line 2	“[40 CFR 261.3(a)(iv)]”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-34/Slide, Line 5	“Spent solvent”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-34/Slide, Line 9	“commercial chemical products”	Identification of Certain RCRA Wastes — the F-Spent Solvent, P, and U Listings; DOE/EH-231-008/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/spent.pdf
HW-34/Notes, Line 1	“ <u>listed</u> wastes”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf

HW-35/Slide, Line 1	“Derived-from” Rule Exemptions”	The “Derived-from” Rule under the Resource Conservation and Recovery Act, DOE/EH-231-035/0693; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/derived.pdf
HW-35/Slide, Line 2	“[40 CFR 261.3(c)(ii)]”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-35/Slide, Line 10	“Hazardous debris”	Hazardous Debris Case-By-Case Capacity Variance; Environmental Guidance Regulatory Bulletin dated July 15, 1992; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/debris.pdf
HW-36/Slide, Lines 1&2	“Hazardous Wastes That Are Recycled”	Requirements for the Recycling of Hazardous Waste; DOE/EH-231-001/0990; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/recycle.pdf
HW-36/Slide, Line 3	“Recyclable materials”	Special Requirements Applicable to Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/special.html
HW-36/Slide, Line 9	“Recyclable materials exempt from regulation”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-36/Notes, Line 2	“Recyclable materials”	Special Requirements Applicable to Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/special.html
HW-36/Notes, Line 6	“used oil”	Used Oil Final Rule and Correction Notices Issued; Environmental Guidance Regulatory Bulletin dated October 31, 1993 [NOT available on the OEPA Website]
HW-36/Notes, Line 10	“40 CFR Part 279”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-37/Slide, Line 1	“Universal Wastes”	Universal Waste Rule: Final Rule Issued; Environmental Guidance Regulatory Bulletin, August 14, 1995 [NOT available on the OEPA Website]
HW-37/Notes Line 1	“May 11, 1995 Federal Register”	Federal Register Online via GPO Access; http://www.access.gpo.gov/su_docs/aces/aces140.html
HW-37/Notes Line 3	“40 CFR part 273”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html

HW-38/Slide, Line 3	“40 CFR 261.7”	“Code of Federal Regulations - Retrieve CFR by citation”; http://www.access.gpo.gov/nara/cfr/index.html
HW-38/Slide, Line 4	“Empty containers”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-38/Slide, Line 6	“Containers are empty”	Special Requirements Applicable to Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/special.html
HW-39/Slide, Line 1	“Are Containers Hazardous?”	Exclusions and Exemptions from RCRA Hazardous Waste Regulation; DOE/EH-231-034/0593; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/exclude.pdf
HW-39/Slide, Line 2	“40 CFR 261.7”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-39/Slide, Lines 3-4	“Containers that held acute hazardous waste”	Special Requirements Applicable to Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/special.html
HW-40/Slide, Line 1	“40 CFR 260.22”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-40/Notes, Line 4	“June 25, 1996 Federal Register	Federal Register Online via GPO Access; http://www.access.gpo.gov/su_docs/aces/aces140.html
HW-40/Notes, Line 6	“Appendix IX, 40 CFR 261”	“Code of Federal Regulations - Retrieve CFR by citation” ; http://www.access.gpo.gov/nara/cfr/index.html
HW-41/Notes, Line 7	“HWIR-waste”	DOE Consolidated Comments - Resource Conservation and Recovery Act; “Hazardous Waste Management System: Identification and Listing of Hazardous Waste: Hazardous Waste Identification Rule (HWIR)”; http://tis-nt.eh.doe.gov/oepa/comments/rcra/hwir-com.pdf
HW-41/Notes, Line 8	“HWIR-media”	DOE Consolidated Comments - Resource Conservation and Recovery Act; “Consolidated Departmental Response to Proposed Hazardous Waste Identification Rule for Contaminated Media (HWIR-Media)”; http://tis-nt.eh.doe.gov/oepa/comments/rcra/hwir2.PDF
HW-42/Slide, Lines 3-4	“solid waste definition”	RCRA Definitions of Solid and Hazardous Waste Automated Guidance (Windows Version); http://tis-nt.eh.doe.gov/oepa/programs/rcrdef.html
HW-42/Slide, Line 5	“hierarchy”	Overview of the Identification of Hazardous Waste Under RCRA; DOE/EH-231-007/1291; http://tis-nt.eh.doe.gov/oepa/guidance/rcra/define.pdf